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NONDERIVATIVE OPTIMIZATION

FINAL REPORT

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Principal Investigator

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SCHOOL OF ORGANIZATION AND MANAGEMENT
YALE UNIVERSITY
NEW HAVEN, CONNECTICUT

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FINAL REPORT

The research conducted under Grant No. AFOSR-74-2695 during the period 15 April 1974 to 31 August 1976 is contained in [4], [5], [9], [10], [11], [12], [13] and [14].

In [13] we have made a significant breakthrough for solving problems involving functions that are not everywhere differentiable. This work modifies and extends Wolfe's [16] and Lemarechal's [8] methods for unconstrained minimization of nondifferentiable convex functions to constrianed optimization problems involving "semismooth" functions [14]. The method can be thought of as a generalized reset conjugate gradient algorithm. Such methods are important, because "steepest descent" methods may fail [15] to converge on nondifferentiable problems. We conjecture that our algorithm can be generalized for finding solutions of fixed point problems and, thus, we will have a new method for solving general equilibrium problems that does not subdivide the space or use derivatives.

Our class of semismooth functions properly contains [14] Feuer's [3,4] class of minimax functions (i.e. functions that are locally expressible as the pointwise maximum or minimum of a compact family of continuously differentiable functions) and this latter class contains convex and concave functions as well as continuously differentiable functions. Also, a semismooth composition of semismooth functions results in a semismooth function [14]. Nondifferentiable problems with semismooth functions arise naturally in the decomposition of large scale optimization problems [7], in engineering design [2,6], in gaming and in multiperiod stochastic programming [1].

Our earlier work on a nonderivative method for unconstrained minimization of differentiable functions contained in [12] has been extended by May [9,10] to problems with bounds on linear functions of the problem variables. Documentation for a FORTRAN computer code that has worked well on numerous test problems is contained in [11].

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The research supported under this grant has led to new and efficient methods for solving nonlinear optimization problems involving functions that are not everywhere differentiable.

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